Installation Note

Agilent PSA Series Spectrum Analyzers Option 110 Preamplifier Retrofit Kit

Agilent Technologies

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Notice.

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Preamplifier Installation Kit

Products Affected:	PSA E4440A PSA E4443A PSA E4445A
Serial Numbers:	US0000/US9999 MY0000/MY9999 SG0000/SG9999
To Be Performed By:	(X) Agilent Service Center (X) Personnel Qualified by Agilent ( ) Customer
Estimated Installation Time: Estimated Adjustment and Verification Time for Hardware Kit following Installation:	3 Hours 5 Hours (See note 2)
Additional Recommended Task	Agilent recommends that a full calibration be performed to verify instrument specifications. (See note 3)

Introduction

This retrofit kit provides all parts and instructions for retrofitting the 10 MHz to 26.5 GHz, 30 dB Preamplifier Option 110 into the PSA series analyzers.

The Option Driver Board from the kit is required to bias the preamplifier and to control the switch that switches the preamplifier in and out of the signal path. This board also contains the flatness compensation data for the preamplifier.

NOTE

1. This option is not compatible with the Option 1DS, 3 GHz preamplifier. Option 1DS must be uninstalled before installing Option 110. Damage to the instrument may result if they are both installed.

2. The installation of this kit requires that some performance testing be performed in order to assure the new option is functioning properly. This installation note includes a list of required performance tests. Completing the performance tests does not guarantee the instrument meets all specifications.

3. The instrument end user must determine whether they need a full instrument calibration following the installation of the kit. If a full calibration is required, arrangements regarding the level of calibration must be made between the end user and the calibration provider.

4. This option is licensed for one instrument model/serial number combination. The license key will only install on the designated instrument.

Contents

Quantity	Description	Agilent Part Number
1	Installation Note	This note
1	User's and Programmers Guide Vol. 1	--
1	Specs Guide	--
1	Option Upgrade Entitlement Certificate	5964-5141
1	AT4, Microwave Attenuator, 3 db	0955-2078
1	A36, Microwave Amplifier	0955-1663
1	FL4, Filter, 3 GHz, High Pass	0955-1906
1	Shield, Front Panel	E4440-00050
1	SW6, Microwave Switch, 26.5 GHz	N1811-60005
1	Option Driver Board	E4440-60459
1	Bracket Plate	E4440-00051
1	W8, Cable, semi-rigid, Attenuator A to Attenuator B cable (used only if eliminating Option H26)	E4440-20068
1	W37, Cable, semi-rigid, FL1 Low Pass Filter to A20 Low Band Assembly (allows elimination of Option 1DS)	E4440-20074
1	W106, Wire Harness, Option Driver P1 to Preamplifier	E4446-60076
1	W109, Cable, semi rigid, A15 Attenuator to SW 6 port 2	E4440-20315
1	W110, Cable, semi rigid, SW 6 port 3 to RYTHM (when Option 110 is installed without Option 123)	E4440-20316
1	W111, Cable, semi-rigid, SW6 port 3 to RYTHM (when Option 110 is installed in instrument that already has Option 123 installed)	E4440-20317
1	W112, Cable, semi-rigid, Amplifier OUT to SW6 port 4	E4440-20323
1	W113, Cable, semi-rigid, Amplifier In from SW6 port 1	E4440-20304
1	W114, Cable, ribbon, 10C, Switch Control. From Option Driver Assembly J3 to SW6	E4440-60427
1	W115, Cable, semi-rigid, FL4 to A34 Dual Mixer	E4440-20324
4	Washer-LK HLCL NO. 2, .088-IN-ID	2190-0112
4	Screw, 2-56 .312 IN-LG PAN-HD-POZI	0520-0129
4	Screw, M3x0.5, 8mm long	0515-0372
2	Screw, M3x0.5 20mm long	0515-1410
1	Clamp, cable, PVC	1400-0611
1	Preamp ON Max RF Level Label	E4440-80581

Tools Required

1. T-10 Torx driver
2. T-20 Torx driver
3. 5/16-inch open end wrench
4. 7/16-inch open end wrench
5. POZI-1 driver

- ❏ PSA Series Spectrum Analyzer and Service Guide. This manual is available as part of the E4440AU, E4443AU, or E4445AU Option OBW kits.
- ❏ Calibration software. Latest software information and downloads available at http://www.agilent.com/find/calibrationsoftware
- ❏ Test equipment supported by the calibration software.
- ❏ Microsoft Windows based personnel computer with LAN card and CD-ROM drive
- ❏ Windows 2000 or Windows XP
- ❏ Crossover cable if PC or analyzer is not connected to network. Use a CAT, RJ45 cable with cross pinning, Agilent p/n 8121-0545.
- ❏ Firmware revision A.09.10 or later. Download the latest version from http://www.agilent.com/find/psa_firmware, or order the Firmware Update kit.

  Depending on your model number, the firmware update kit is ordered as:

  Order E444xAU (Qty.1) Option UE2 (Qty. 1), where the “x” is the last digit of the model number. For example: E4440AU option UE2

Installation Procedure

For assistance at any time during this procedure, get in touch with your nearest Agilent Technologies Sales and Service Office. To find your local Agilent office access the following URL:

http://www.agilent.com/find/assist

Preliminary Hardware Verification

1. Check for the presence of Option 1DS by pressing **System**, **Show System**, and look at the option list.
   - If Option 1DS is present it must be uninstalled before Option 110 can be installed.
     a. Delete Option 1DS License by pressing **System**, **More**, **More**, **Licensing**, **Option**. Use the front panel numerical key pad to enter the option designator 1DS and press the **Enter** key. Press **Delete Option**.
     b. Check that Option 1DS has been removed by pressing **System**, **More**, **Show System**, and looking at the option list.
     c. Follow the instructions in this installation note in the section named "Uninstalling Option 1DS" to remove the Option 1DS hardware.*
   - If Option 1DS is not present then continue with the installation of Option 110.

   *Option 110 and Option 1DS are not compatible. Damage to the instrument may result if they are both installed.
2. Check for the presence of Option H26, High Band Preamp, by pressing **System**, **More**, **Show System**, and look at the option list.
   - If Option H26 is present it must be uninstalled before Option 110 can be installed.
     a. Delete Option H26 License by pressing **System**, **More**, **More**, **Licensing**, **Option**. Use the front panel numerical key pad to enter the option designator H26 and press the **Enter** key. Press **Delete Option**.
     b. Check that Option H26 has been removed by pressing **System**, **More**, **Show System**, and looking at the option list.*
     c. Follow the instructions in this installation note in the section named "Uninstalling Option H26" to remove the Option H26 hardware.*
   - If Option H26 is not present, continue with the installation of Option 110.

   *Option 110 and Option H26 are not compatible. H26 must be completely uninstalled, do not attempt to re-use any Option H26 hardware in place of the new Option 110 hardware from the kit.

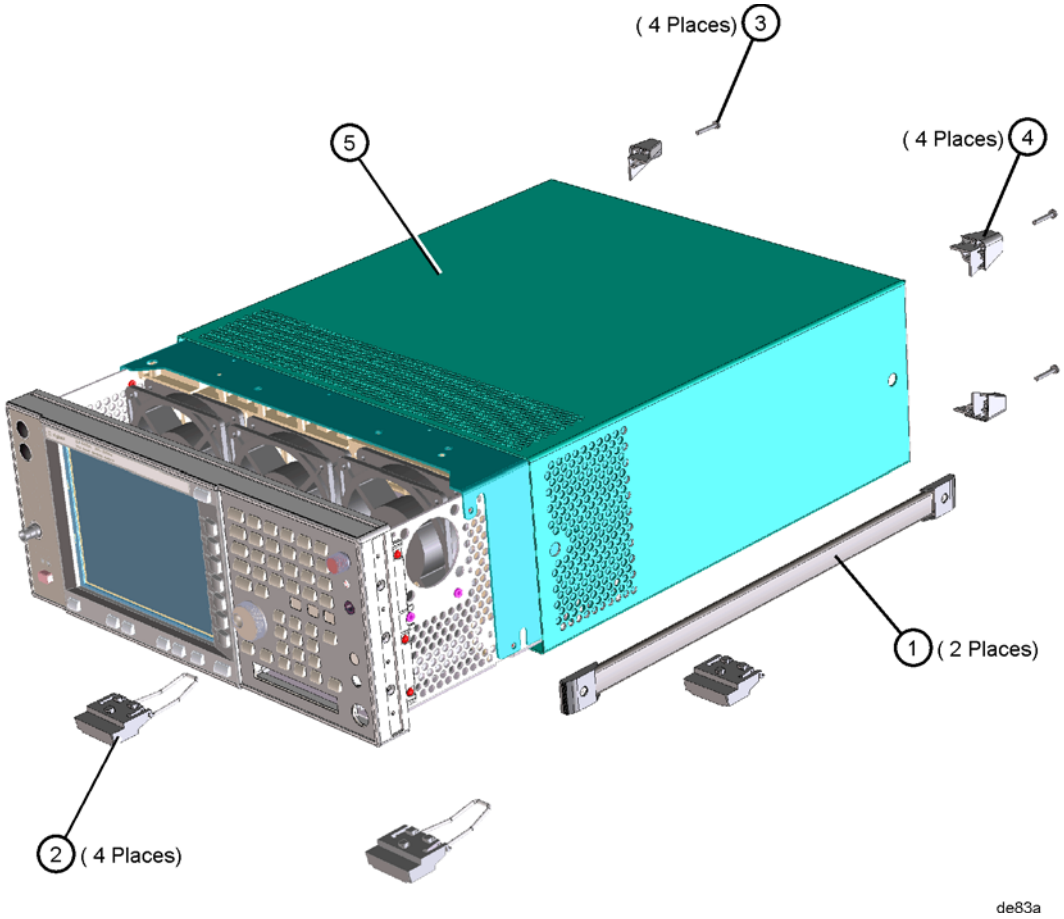
3. Check for the presence of Option 123, Preselector Bypass by pressing **System**, **More**, **Show System**, and look at the option list.
4. Follow the instructions in this installation note in the section named "Installing Option 110".
5. Determine which final installation process to use.
   - If Option 123 is present then finish the installation by following the instructions in this installation note in the section named "Final Cable Installation with Option 123".
   - If Option 123 is not present then finish the installation by following the instructions in this installation note in the section named "Final Cable Installation without Option 123".

Remove the Outer Case

CAUTION If the instrument is placed on its face during any of the following procedures, be sure to use a soft surface or soft cloth to avoid damage to the front panel, keys, or input connector.

1. Disconnect the instrument from ac power.
2. Refer to Figure 1. Remove the two handles on the sides of the instrument as shown. Use the T-20 driver to loosen the screws that attach each handle **(1)**. Remove the handles.
3. Remove the four bottom feet **(2)**. Lift up on the tabs on the feet, and slide the feet in the direction indicated by the arrows.
4. Remove the four screws **(3)** that hold the rear feet **(4)** in place.
5. Pull the instrument cover **(5)** off toward the rear of the instrument.

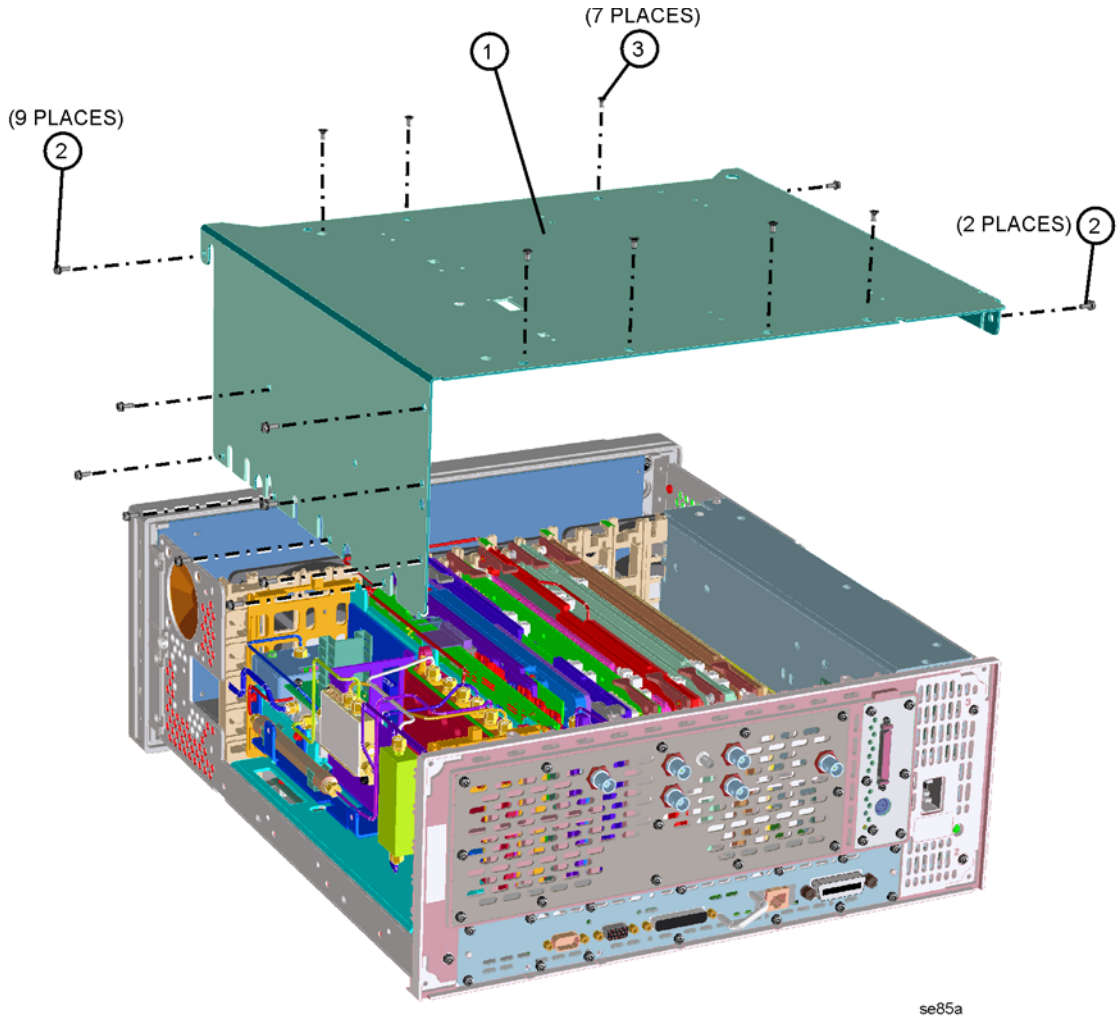
Figure 1 Instrument Outer Case Removal



Remove the Top Brace

1. Refer to Figure 2. Use the T-10 driver to remove the top screws **(3)** (one screw is under the security label), and the side screws **(2)** attaching the top brace **(1)** to the deck.
2. Remove the top brace from the deck.

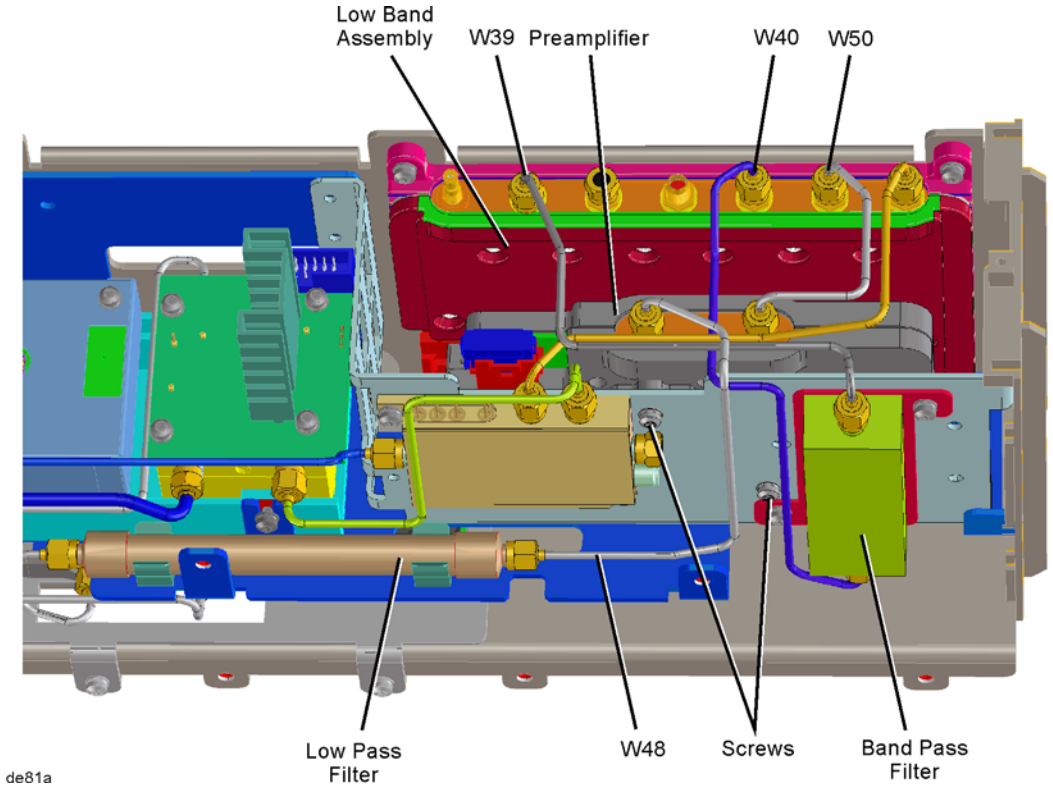
Figure 2 Top Brace Removal



Uninstalling Option 1DS

1. Locate the RF section on the right side of the instrument. Figure 3 shows cable locations and the preamplifier mounting orientation.

Figure 3 Preamplifier Location



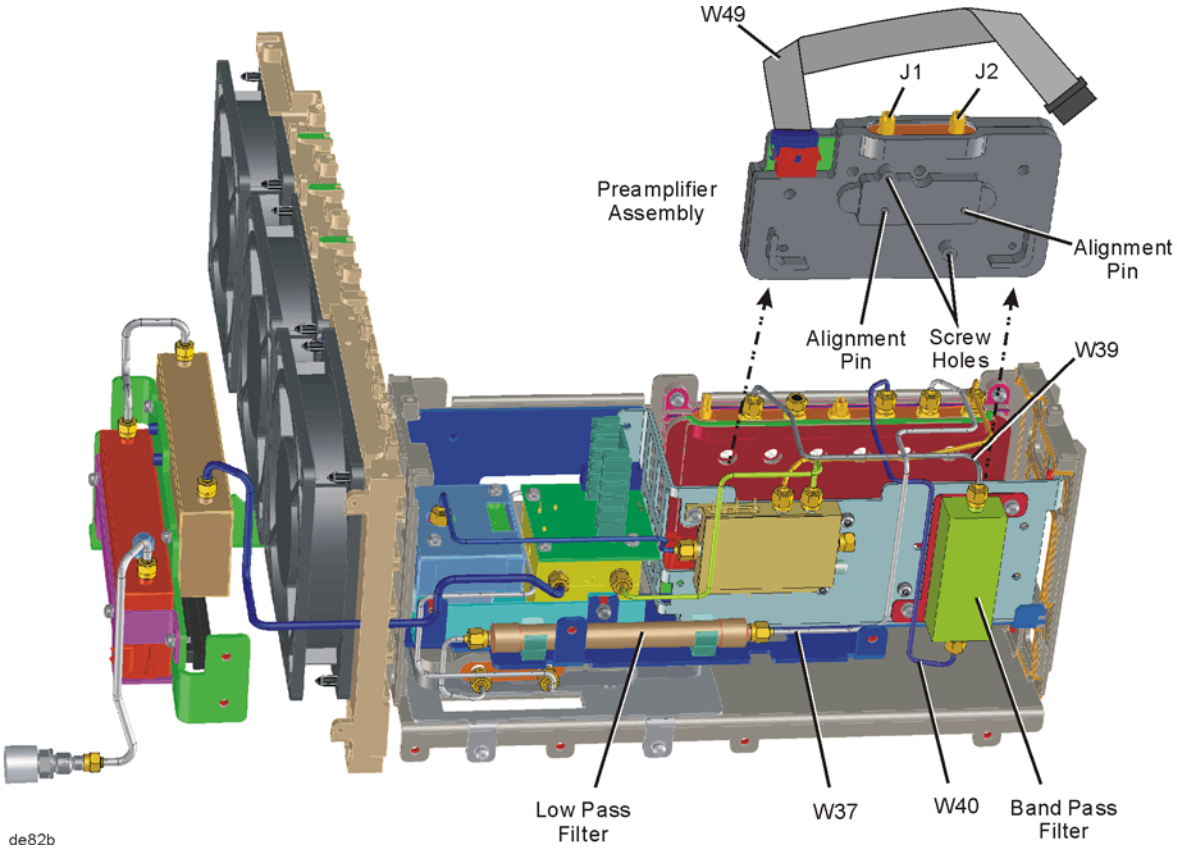
2. Locate and remove cable W40 (Low Band Assembly J3 to Band Pass filter bottom), E4446-20046. This cable will be replaced later. It is removed to allow the preamplifier assembly to removed.
3. Locate and remove cable W39 (Low Band Assembly J4 to Band Pass Filter top), E4446-20058, using the 5/16-inch wrench. This cable will be replaced later. It is removed to allow the preamplifier assembly to be removed.
4. Locate and remove cable W50 (preamplifier J2 and low band assembly J1 RF IN). Discard this cable, since it will be replaced by another cable.

CAUTION In the following step, use a 7/16-inch wrench on one of the wrench flats at the ends of the filter to prevent the filter body from rotating when removing the cable. Cables can be damaged if the low pass filter is allowed to rotate when loosening or tightening the cable connector.

5. Locate and remove cable W48 (Low pass filter and J1 on the Preamp) Discard this cable, since it will be replaced by another cable.

6. Uninstall the preamplifier and the ribbon cable. Use a T-10 Torx driver to remove the two screws.

Figure 4 Remove the Preamplifier



7. Reconnect cable W39 (low band assembly J4 to band pass filter), E4440-20081. Torque to 10 in-lbs.
8. Reconnect cable W40 (Low band assembly J3 to Band Pass filter), E4446-20046. Torque to 10 in-lbs.

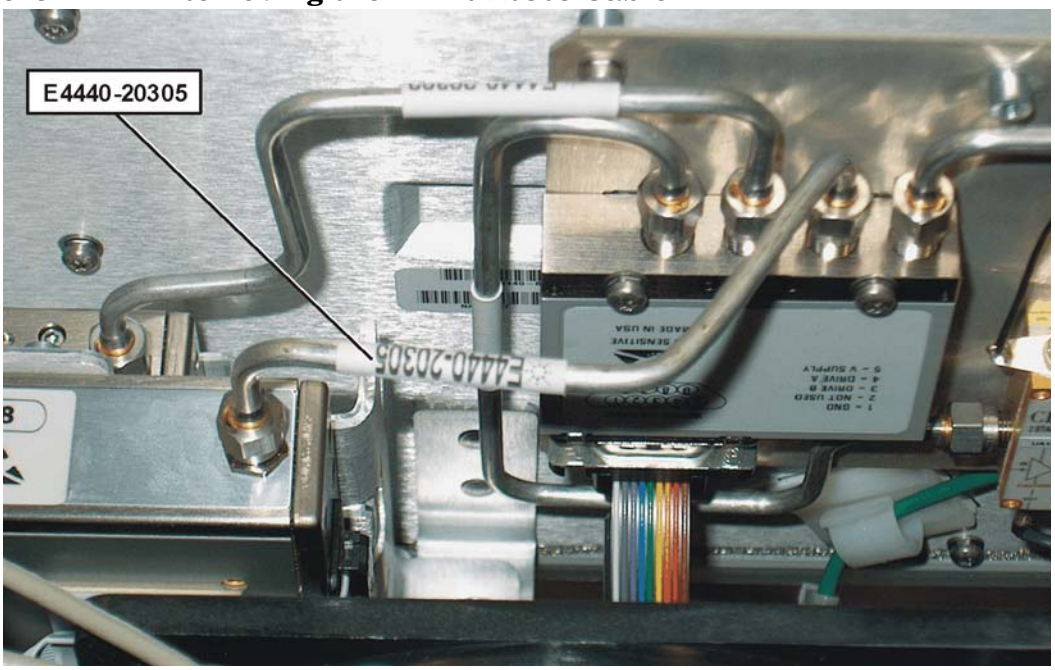
CAUTION In the following step, use a 7/16-inch wrench on one of the wrench flats at the ends of the filter to prevent the filter body from rotating when removing the cable. Cables can be damaged if the low pass filter is allowed to rotate when loosening or tightening the cable connector.

9. Locate the E4440-20074 semi-rigid cable from the kit. This cable is reference designator W37 (low band assembly J1 to low pass filter). Torque to 10 in-lbs.

Uninstalling Option H26

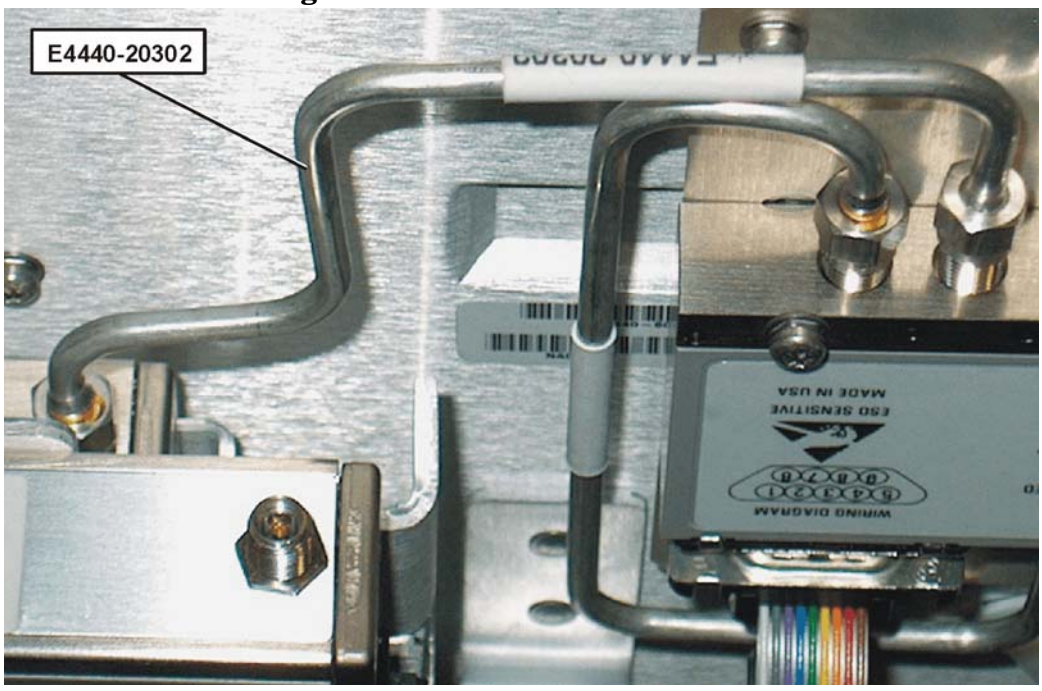
1. Refer to Figure 5. Locate and remove E4440-20305 semi-rigid cable (Attenuator B In to Switch 6 port 3) Discard this cable, since it will be replaced by another cable.

Figure 5 Removing the E4440-20305 Cable



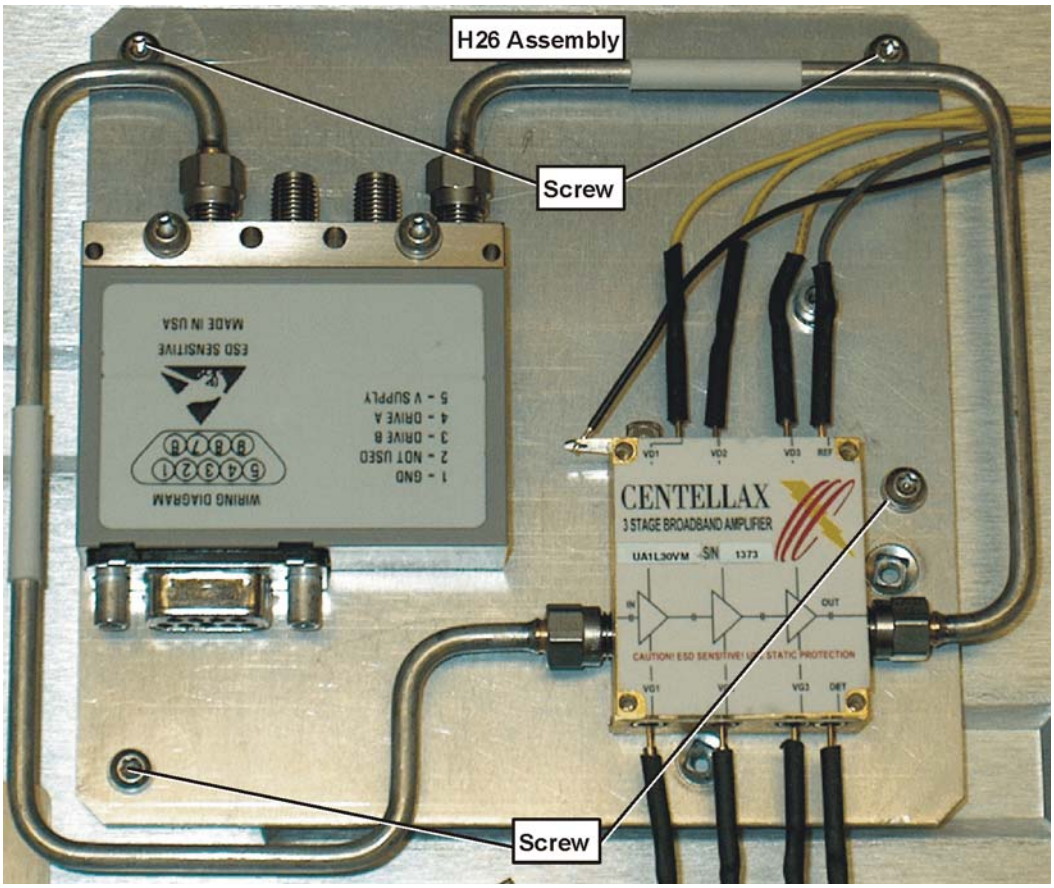
2. Refer to Figure 6. Locate and remove E4440-20302 semi-rigid cable (Attenuator A Out to Switch 6 port 2) Discard this cable, since it will be replaced by another cable.

Figure 6 Removing the E4440-20302 Cable



3. Locate and remove wire harness W106 from the Option Drive Board (Preamplifier to J1 on the Option Driver Board). Discard this cable, since it will be replaced by another cable.
4. Locate and remove Ribbon Cable (E4440-60427) from the Option Driver Board (Preamplifier to J1 on the Option Driver Board) Discard this cable, since it will be replaced by another cable.
5. Drop the Front Frame as described in this installation note.
6. Refer to Figure 7. Locate and remove the H26 assembly from the front panel by removing 4 screws. Discard this assembly.

Figure 7 Removing the H26 Assembly

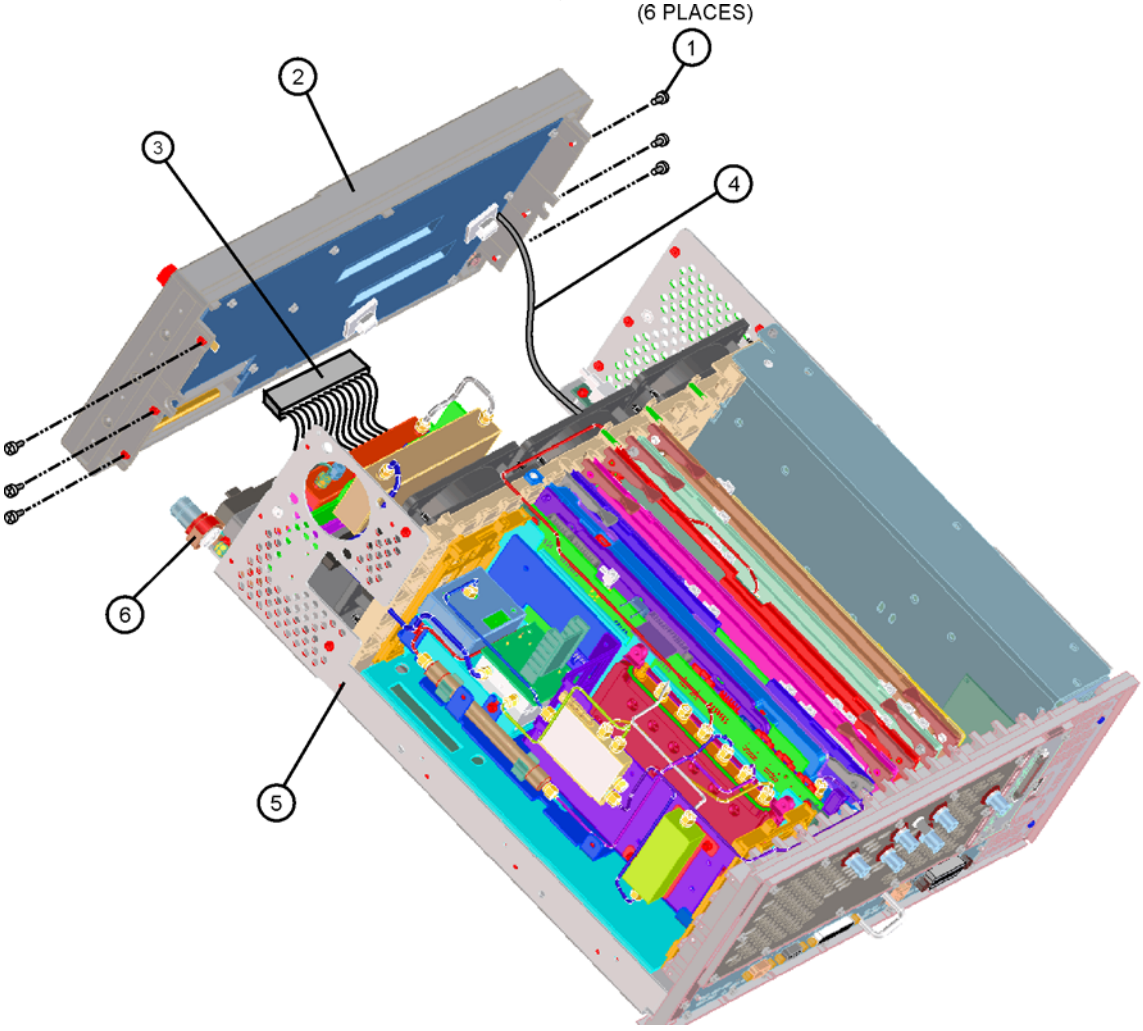


7. Locate E4440-20068 semi-rigid cable from the kit. This cable is reference designator W8 (Attenuator A to Attenuator B). Torque to 10 in-lb.
8. Locate and remove the old Option Driver Board (E4440-60358) from the instrument. Discard this board since it will be replaced by the latest version.

Drop the Front Frame

1. Refer to Figure 8. Using the T-10 driver, remove the 7 screws **(1)** that attach the front frame assembly **(2)** to the deck.
2. Pull the front frame off of the deck until it is disengaged from the disc drive.

Figure 8 Front Frame Assembly Removal



3. At this point, the front frame can be placed flat on the bench for service while still attached to the instrument.

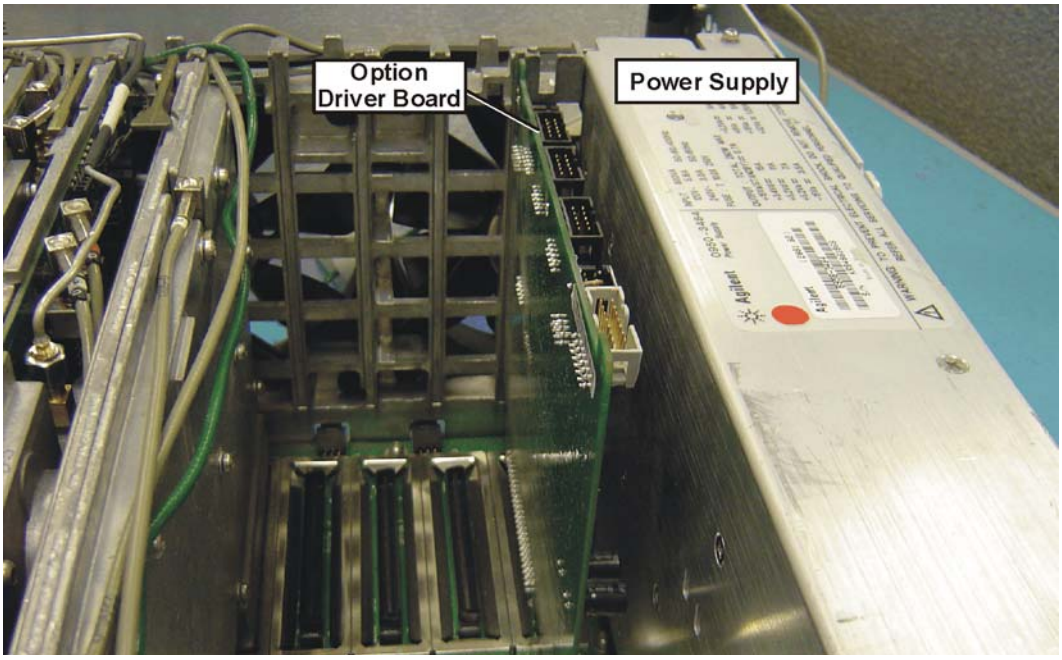
Front Panel Shield

1. Locate E4440-00050 Front Panel Shield from the kit.
2. Inspect the rear of the instrument front panel and compare the existing Front Panel Shield to the one from the kit. Replace the Front Panel Shield on the instrument with the new Front Panel Shield (E4440-00050) supplied in the kit if necessary. The new Front Panel Shield will have four standoffs for attaching the Bracket Plate (E4440-00051).

Installing Option 110

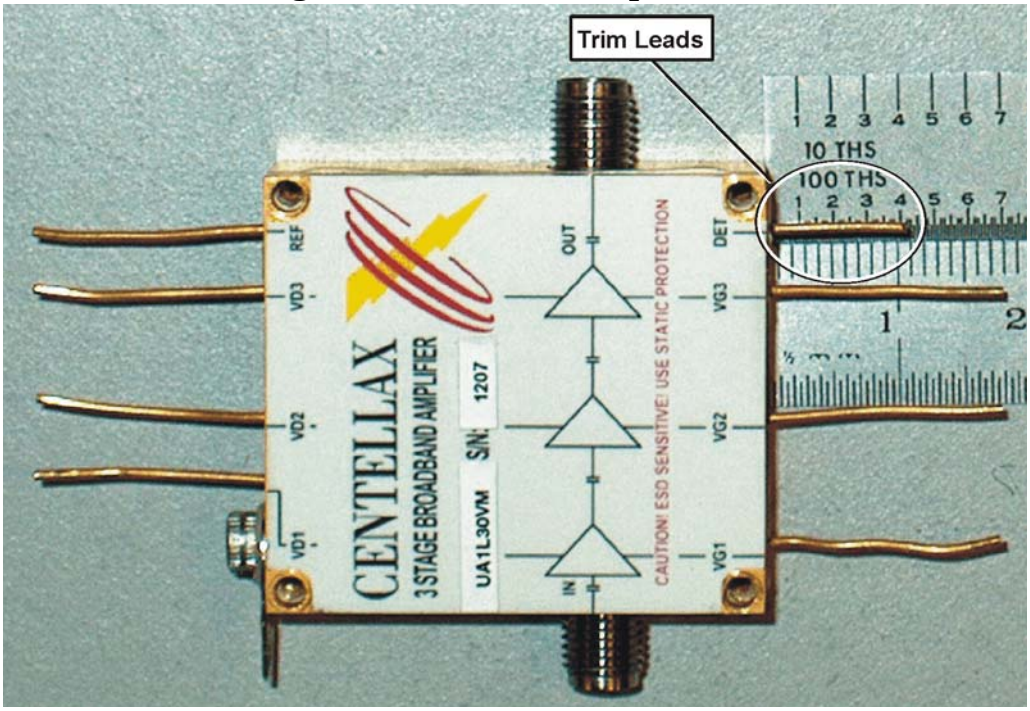
1. Refer to Figure 9. Install the Option Driver board (E4440-60459). The Option Driver board uses the half slot (slot 0) next to the power supply.

Figure 9 Option Driver Board Installation



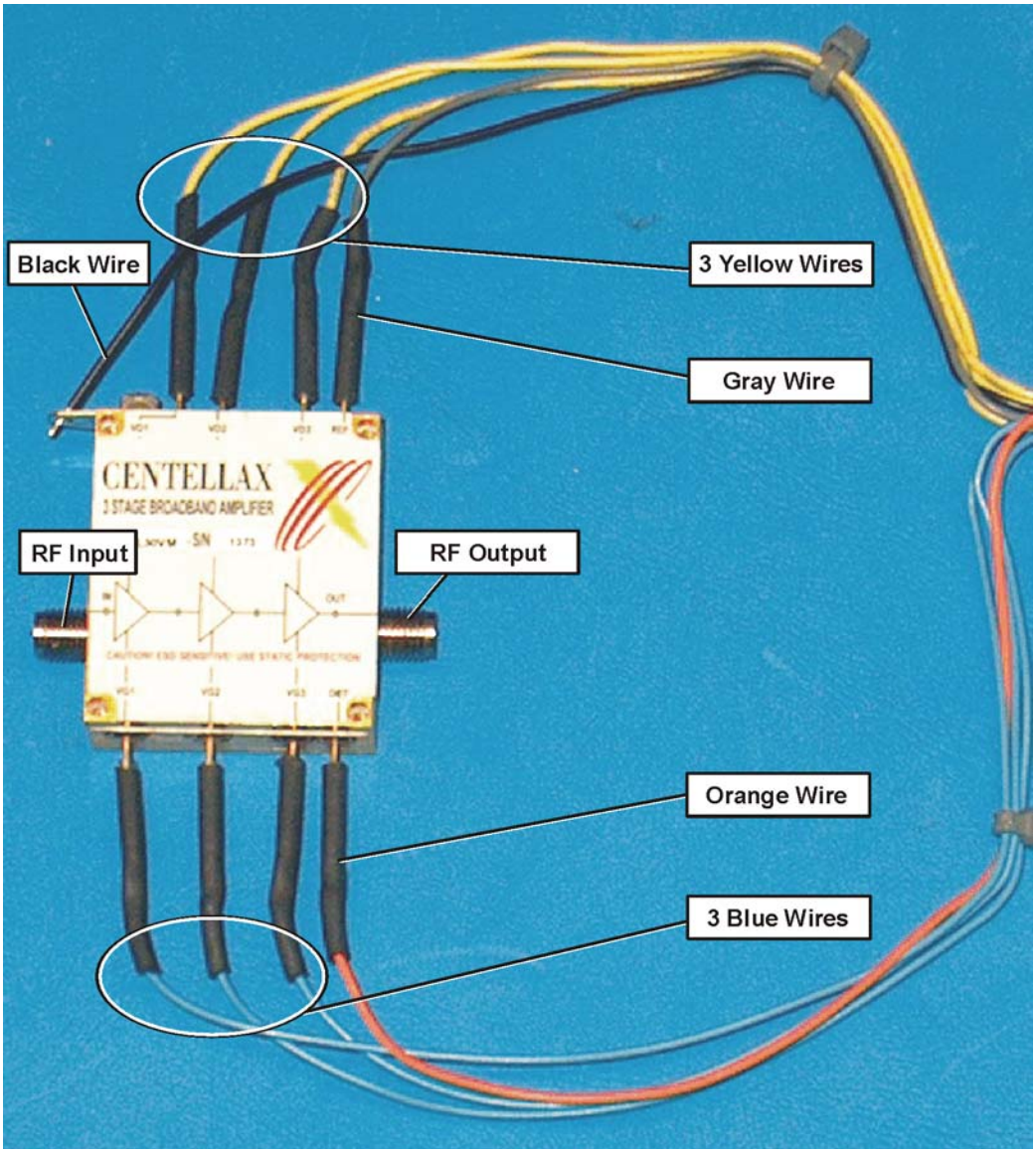
2. Trim all 8 leads on the amplifier (0955-1663) to 1 cm (0.4 in). Figure 10 shows the first lead trimmed to length.

Figure 10 Trimming the Leads on the Amplifier



3. Refer to Figure 11. Install the amplifier cable assembly (E4446-60076) onto the amplifier (0955-1663). Use caution when pressing the wire connectors onto the pins of the amplifier. They are fragile and can be easily bent or broken.

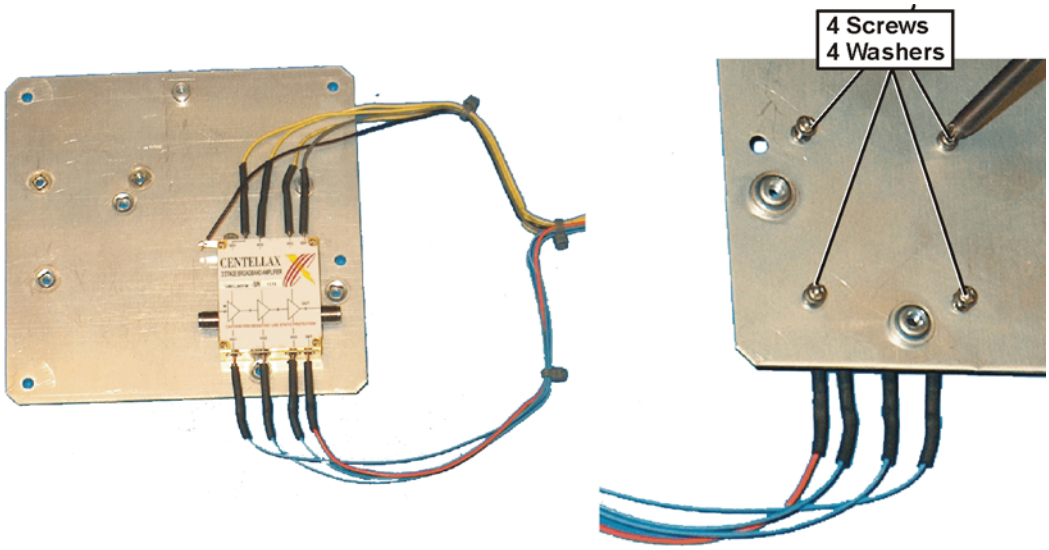
Figure 11 Attaching the Cable Assembly to the Amplifier



4. Solder the black wire to the ground pin on the amplifier.

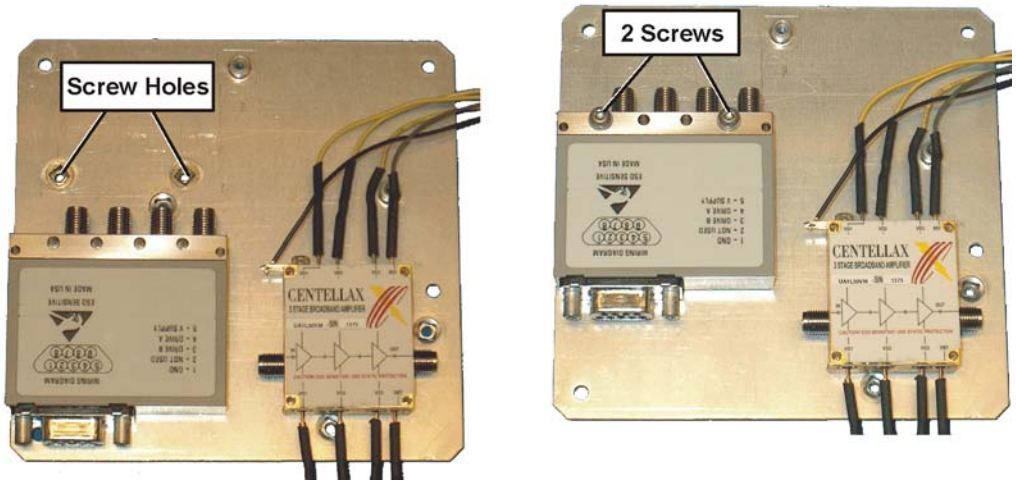
5. Refer to Figure 12. Attach the amplifier (0955-1663) to the bracket plate (E4440-00051) using 4 washers (2190-0112) and 4 screws (0520-0129). The amplifier is positioned such that the output connector is toward the edge of the bracket. Torque to 3 in-lb.

Figure 12 Installing the Amplifier



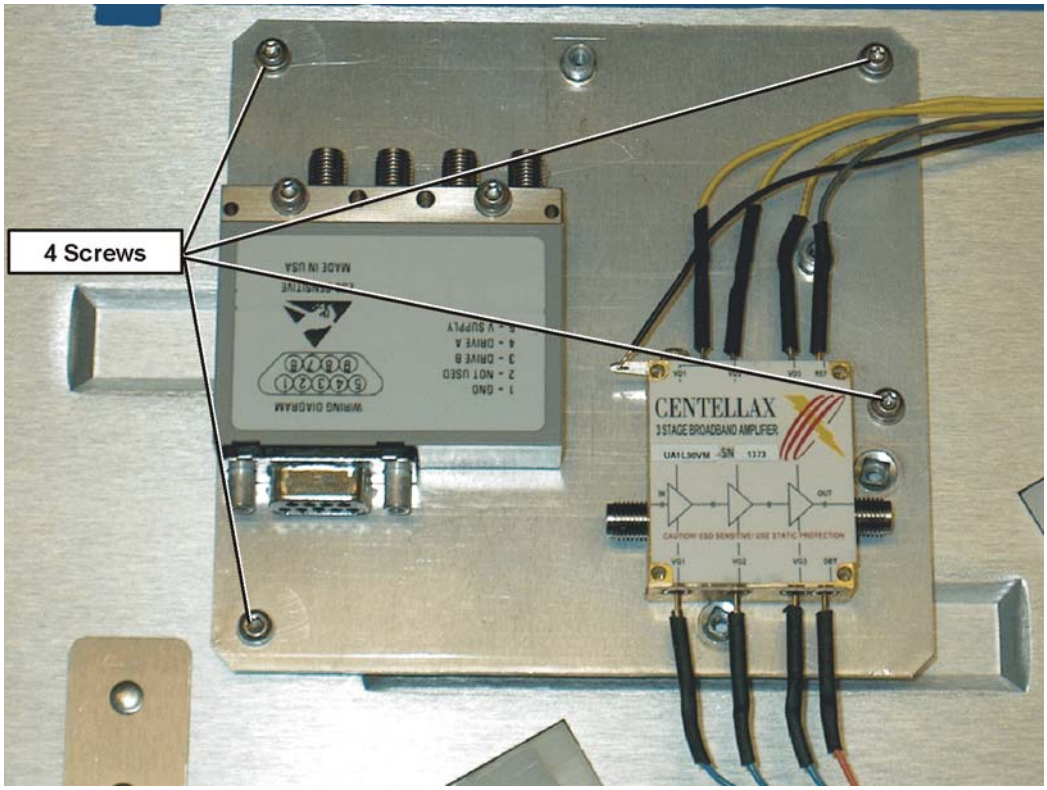
6. Refer to Figure 13. Attach the RF switch (N1811-60005) to the bracket plate (E4440-00051) using 2 screws (0515-1410). Torque to 9 in-lb.

Figure 13 Attaching RF Switch to Bracket



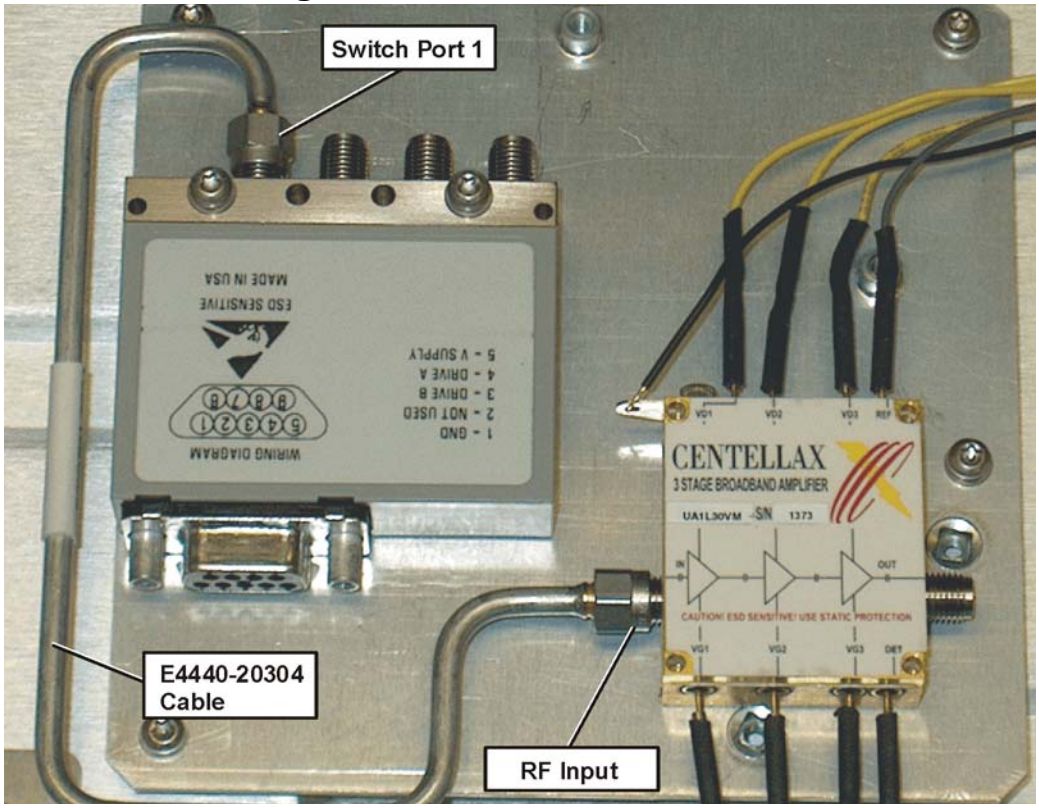
7. Refer to Figure 14. Install the assembled bracket on the front frame using 4 screws (0515-0372). Torque to 9 in-lbs.

Figure 14 Installing the Bracket to the Front Frame



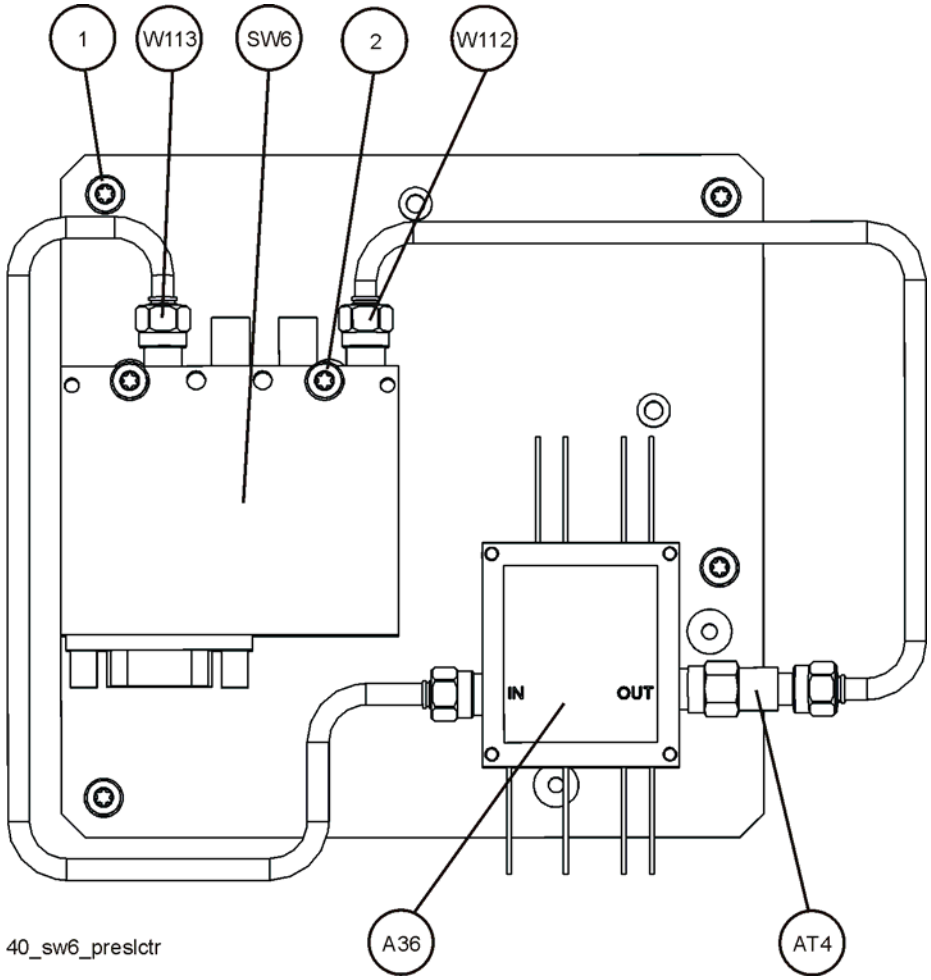
8. Refer to Figure 15. Attach the cable (E4440-20304) from the amplifier “Amp In” connector to the switch “Port 1.” Torque to 10 in-lbs.

Figure 15 Attaching E4440-20304 cable



9. Install the Attenuator AT4 (0955-2078) to the Amplifier “Amp Out” as shown in Figure 16. Torque to 10 in-lbs.

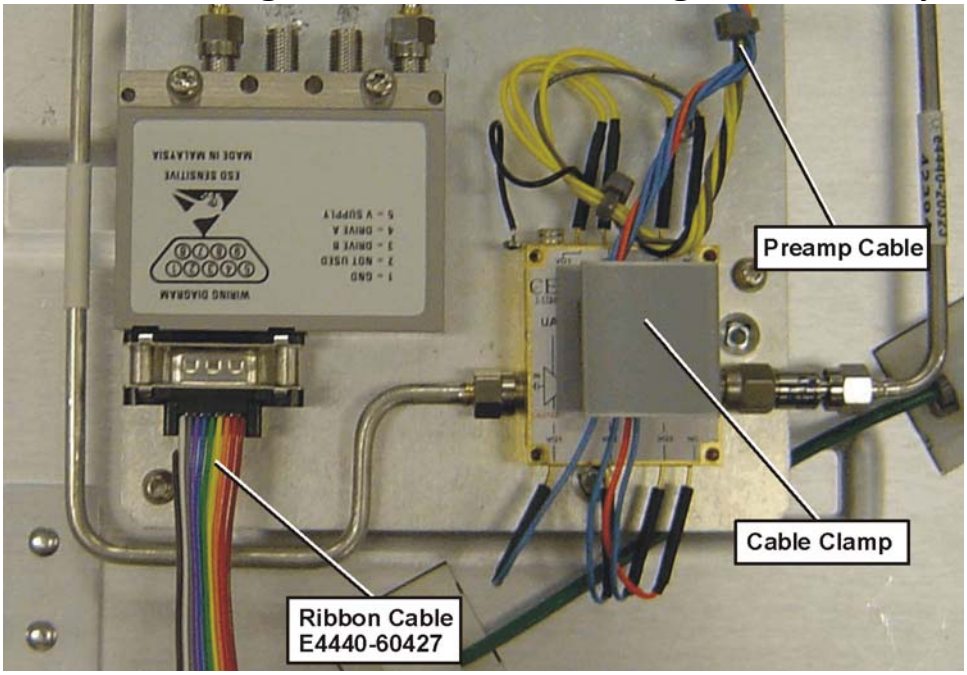
Figure 16 Option 110 A36 Preamplifier and Switch SW6



10. Attach the cable W112 (E4440-20323) from the AT4 Attenuator to the switch Port 4 as shown. Insure that the cable maintains a right-angle when installed. If the cable is installed backwards, the right angle bend in the cable will not be maintained. Torque to 10 in-lbs.

11. Refer to Figure 17. Install one end of the ribbon cable (E4440-60427) to the RF switch.

Figure 17 Installing Ribbon Cable and Routing Cable Assembly

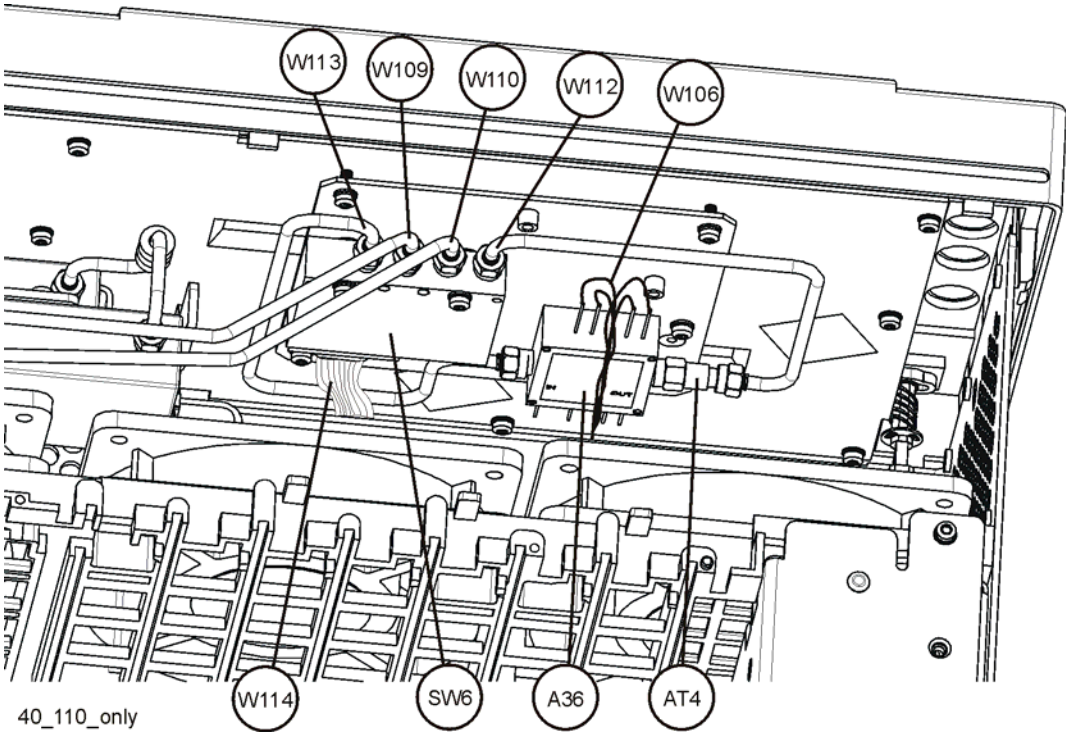


12. Locate the plastic cable clamp in the kit and attach it to the amplifier.
13. Route the preamp cable through the cable clamp as shown in Figure 17. This routing provides stress relief to the amplifier connection pins.
14. Skip to the section named "Final Cable Installation without Option 123" or "Final Cable Installation with Option 123", as the case may be.

Final Cable Installation without Option 123

1. Refer to Figure 8. Place the front frame assembly in front of the deck.
2. Position the front frame on the deck using the alignment bosses on the deck **(5)**. Remember to tuck the ribbon cable under the fans when pushing the frame onto the deck. This will insure proper airflow to cool the instrument. Using the T-10 driver, replace the 7 screws **(1)** that secure the front frame to the deck. Torque to 9 inch pounds.
3. Remove semi-rigid cable W9 from the RYTHM to Attenuator B. This cable will be discarded.
4. Locate the E4440-20315 semi-rigid cable from the kit. This cable is reference designator W109 (Switch 6 port 2 to Attenuator B). Torque to 10 in-lb.

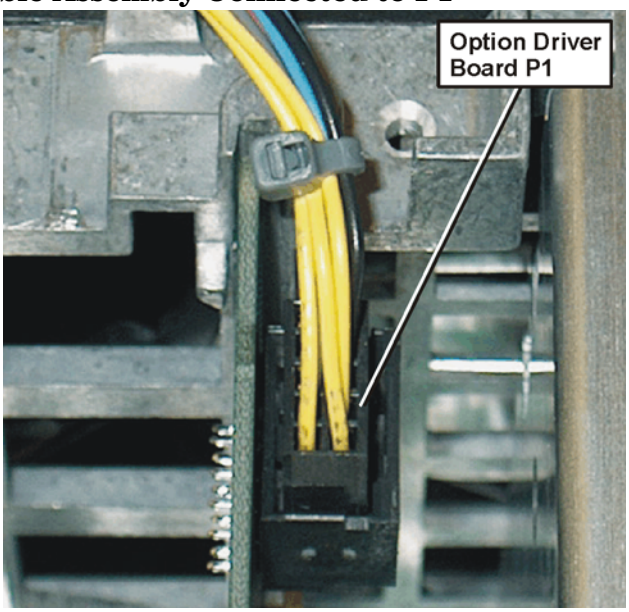
Figure 18 Option 110 Assemblies and Cables



5. Locate the E4440-20316 semi-rigid cable from the kit. This cable is reference designator W110 (Switch 6 port 3 to RYTHM). Torque to 10 in-lb.

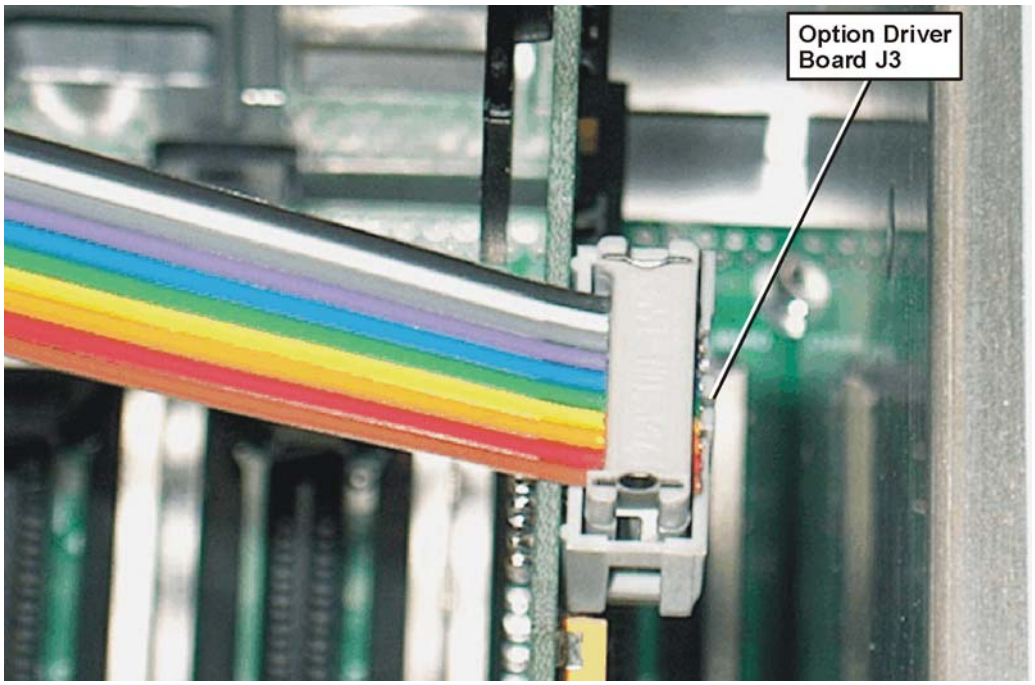
6. Refer to Figure 19. Plug the cable assembly (E4446-60076) into P1 of the Option Driver board.

Figure 19 Cable Assembly Connected to P1



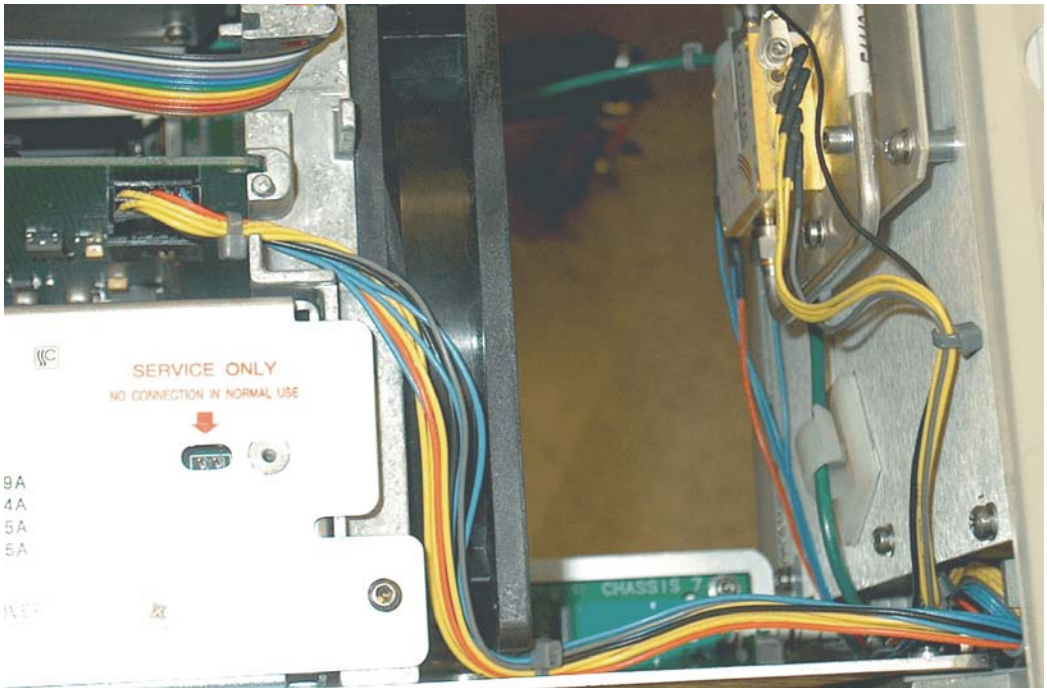
7. Refer to Figure 20. Plug the loose end of the ribbon cable (E4440-60427) into J3 of the Option Driver board.

Figure 20 Ribbon Cable Connected to J3



8. Refer to Figure 21. Dress the cable assembly (E4446-60076).

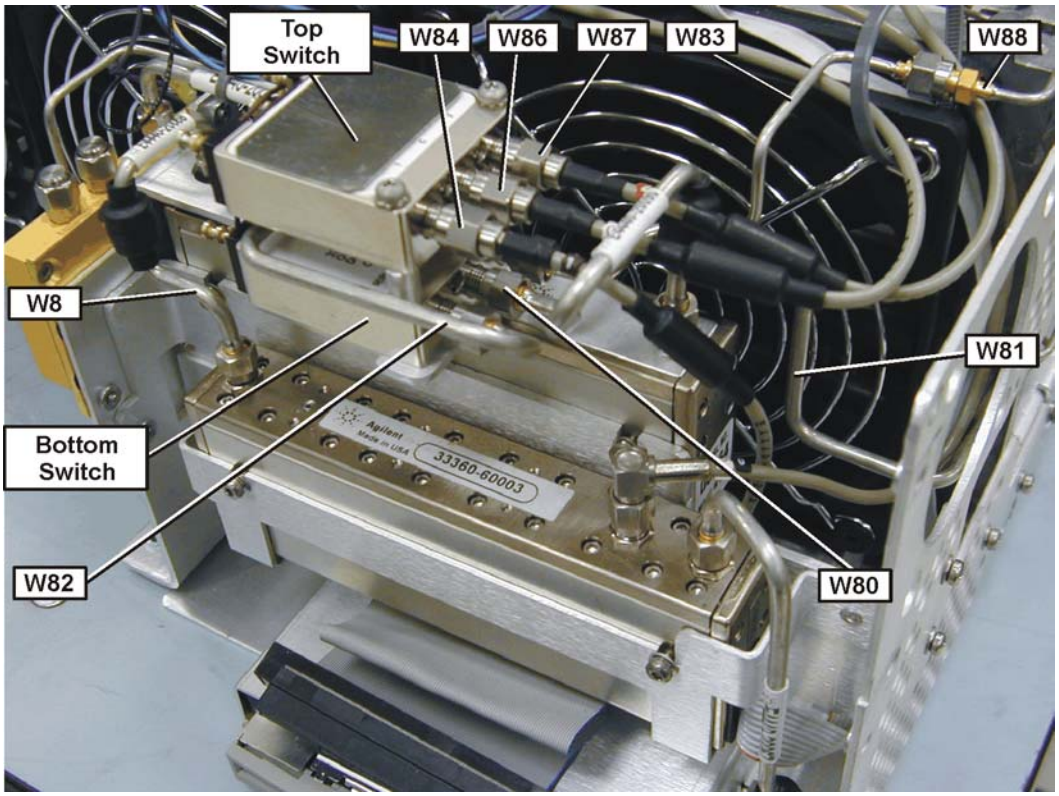
Figure 21 Dressing the Cable Assembly



Final Cable Installation with Option 123

1. Locate and remove E4440-60289 coax cable W84 (Switch 2 port 1 to A34 Dual Mixer Out). This cable will be replaced later, it is removed so that other cables can be reached.

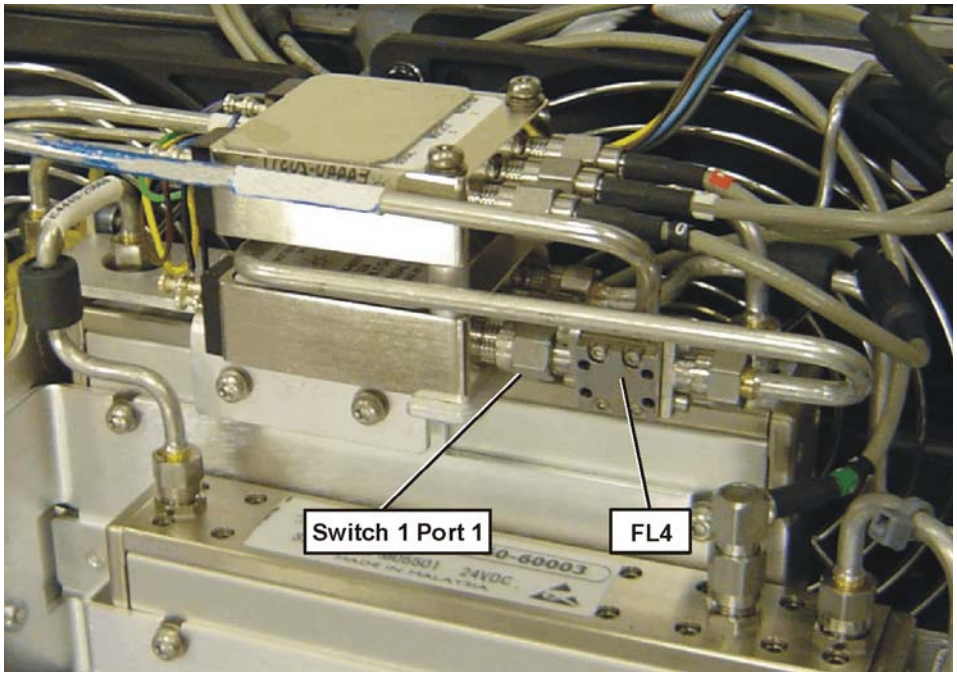
Figure 22 Option 123 Assemblies and Cable Locations



2. Locate and remove E4440-60373 coax cable W86 (Switch 2 port C to 3rd Converter J1). This cable will be replaced later, it is removed so that other cables can be reached.
3. Locate and remove E4440-60373 coax cable W87 (Switch 2 port 2 to RYTHM). This cable will be replaced later, it is removed so that other cables can be reached.
4. Locate and remove E4440-20092 semi-rigid cable W82 (Mixer Input to Switch 1 port 1). Discard this cable, since it will be replaced by another cable.
5. Locate and remove E4440-20305 semi-rigid cable W80 (Attenuator B to Switch 1 port C). Discard this cable, since it will be replaced by another cable.

6. Refer to Figure 23. Locate the 0955-1906 High Pass Filter from the kit. This filter is reference designator FL4. Connect Filter to Switch 1 Port 1 as shown. Torque to 10 in-lb.

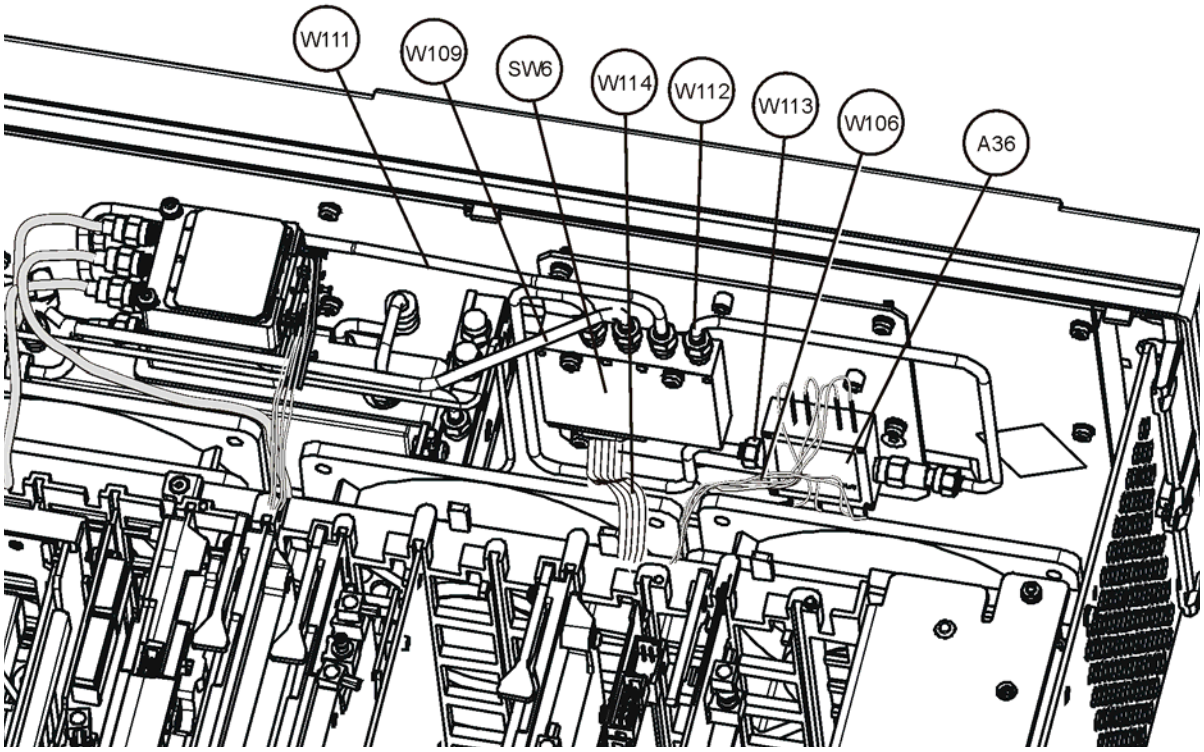
Figure 23 FL4 Location



7. Locate the E4440-20317 semi-rigid cable from the kit. This cable is reference designator W111 (Switch 1 port 6 to Switch 6 port 3). Connect the cable to Switch 1 port C and torque to 10 in-lb. Leave the other end of the cable disconnected.
8. Locate the E4440-20324 semi-rigid cable from the kit. This cable is reference designator W115 (FL4 on Switch 1 port 1 to Mixer Input). This cable is routed in-between Switch 1 and Switch 2 as shown. Torque to 10 in-lb.
9. Refer to Figure 8. Place the front frame assembly in front of the deck.
10. Position the front frame on the deck using the alignment bosses on the deck **(5)**. Remember to tuck the ribbon cable under the fans when pushing the frame onto the deck. This will insure proper airflow to cool the instrument. Using the T-10 driver, replace the 7 screws **(1)** that secure the front frame to the deck. Torque to 9 inch pounds.

11. Refer to Figure 24. Locate the E4440-20315 semi-rigid cable from the kit. This cable is reference designator W109 (Switch 6 port 2 to Attenuator B). Torque to 10 in-lb.

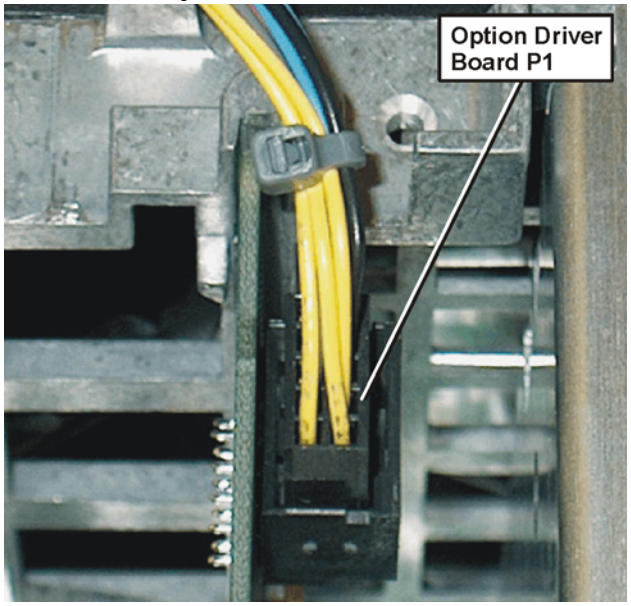
Figure 24 E4440A, E4443A, E4445A - Option 110 (with Option 123)



12. Connect the other end of W111 to Switch 6 port 3. Torque to 10 in-lb.
13. Reconnect E4440-60289 coax cable W84 (Switch 2 port 1 to A34 Dual Mixer Out). Torque to 10 in-lb.
14. Reconnect E4440-60373 coax cable W86 (Switch 2 port C to 3rd Converter J1). Torque to 10 in-lb.
15. Reconnect E4440-60373 coax cable W87 (Switch 2 port 2 to RYTHM). Torque to 10 in-lb.

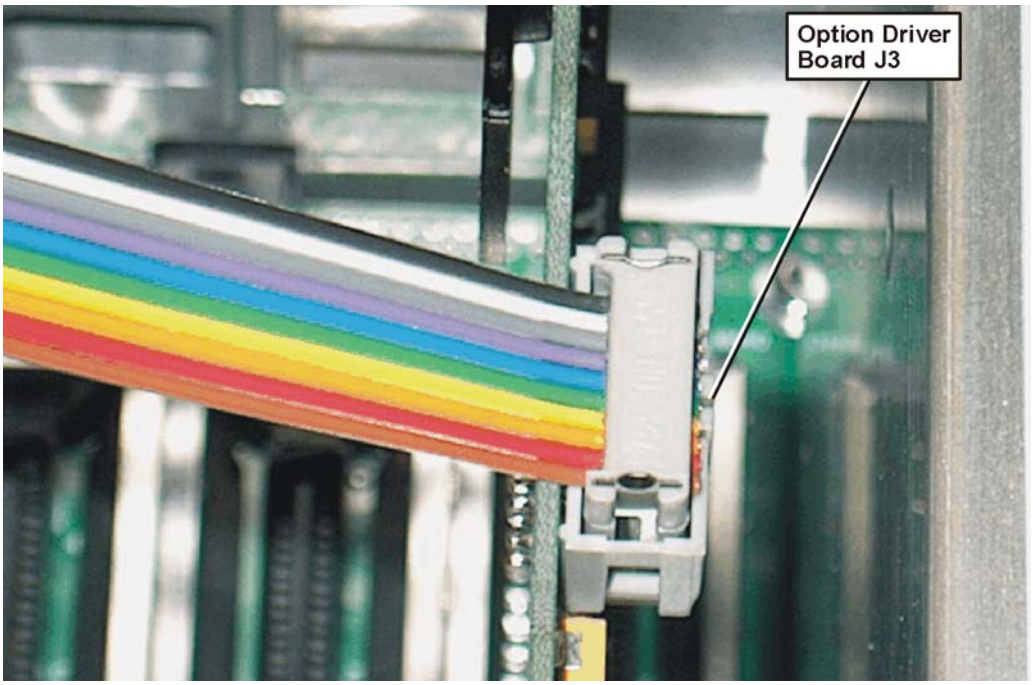
16. Refer to Figure 25. Plug the cable assembly (E4446-60076) into P1 of the Option Driver board.

Figure 25 Cable Assembly Connected to P1



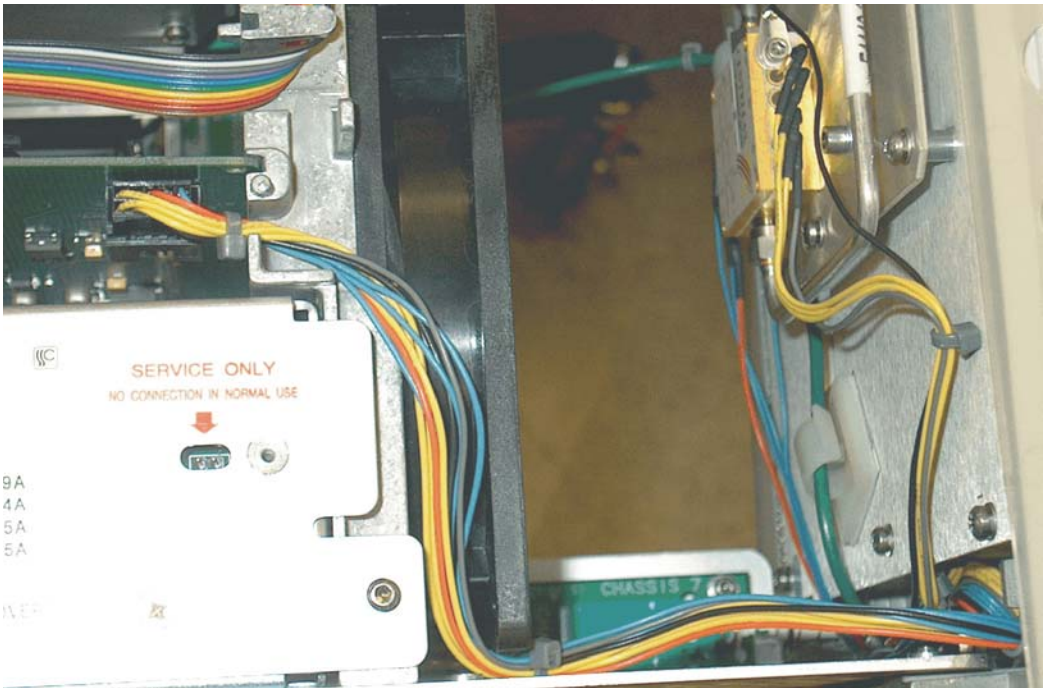
17. Refer to Figure 26. Plug the loose end of the ribbon cable (E4440-60427) into J3 of the Option Driver board.

Figure 26 Ribbon Cable Connected to J3



18.Refer to Figure 27. Dress the cable assembly (E4446-60076).

Figure 27 Dressing the Cable Assembly



Replace the Top Brace and Outer Case

1. Refer to Figure 2.
2. Carefully position the top brace on the deck. The alignment pin at the center of the web/fan assembly must mate with the alignment hole on the top brace. Make sure that no coaxial cables will get pinched underneath the brace.
3. Use the T-10 driver to replace and tighten the top screws first; then replace the side screws. Torque to 101 Ncm (9 in-lb).
4. Refer to Figure 1.
5. Slide the instrument cover back onto the deck from the rear. The seam on the cover should be on the bottom. Be sure the cover seats into the gasket groove in the front frame.
6. Replace the four rear feet onto the rear of the instrument. Torque to 236 Ncm (21 in-lb).
7. Use the T-20 driver to replace the handles. Torque to 236 Ncm (21 in-lb).
8. Replace the four bottom feet by pressing them into the holes in the case and sliding them in the opposite direction of the arrows until they click into place. Note that the feet at the front have the tilt stands.
9. Remove the existing warning label near the RF input connector. Attach the new warning label (E4440-80581) included in this kit to the same location on the front panel.

Obtain a License Key and Activate the Option

The entitlement certificate supplied in this kit allows you to obtain a license key from our Agilent website so you can enable this upgrade option. Once you have retrieved the license key, you can begin the process of activating the option.

NOTE The option designator 110 and the license keyword must be entered into instrument memory in addition to the correct firmware before the hardware will function.

1. Locate the License Key Entitlement Certificate in the kit and follow the directions to redeem it. A license keyword will be e-mailed to you.
2. Plug in instrument and power up. There may be alignment error messages since new hardware was installed.
3. On the instrument front panel press: **System**, **More**, until the **Licensing** softkey is visible. Press **Licensing** and **Option**. This will activate the alpha editor menu. Use the alpha editor and the front panel numerical keypad to enter the upper-case option designator 110. Enter the letters using the alpha editor and the numeric keypad to enter the numbers. Press the **Enter** key. Note that 110 now appears on the **Option** key.
4. Press **License Key**. The license key number is a hexadecimal number that will require the entry of both letters and numbers. Use the alpha editor and the front panel numerical keypad to enter the license key number. Your entry will appear in the active function area of the display. If you make a typing error, use the backspace key to correct the error. Check the license key number you entered. Press **Enter**, **Activate License**.

Install New Instrument Firmware

Download the PSA Update Program and the PSA Firmware Procedure from

http://www.agilent.com/find/psa_firmware

Follow the directions to install the firmware.

Alternate method:
Install the Firmware Upgrade Kit E4440AU Option UE2.

Verify the Option is Enabled

Check for the presence of Option 110 by pressing **System, Show System** and verify that `110` appears in the option field.

Check for the recognition of hardware by pressing **System**, **Show Hardware** and looking for Option Driver Board.

Utilities, Adjustments and Performance Verification Tests Required

Utilities Required

Under the Utilities test plan, perform the Calibration Constant Reset for Installing Option 110.

Adjustments Required

Adjustments
Frequency Response adjustment less than 3 GHz
Frequency Response adjustment above 3 GHz
Frequency Response adjustment (Option 110)
Frequency Response adjustment (Option 123) if Option 123 is present

Performance Testing Required

The performance tests listed below are the minimum set that will verify the hardware retrofit just installed is functioning correctly. Performing only these tests does not guarantee the instrument meets all specifications.

A full calibration is required to assure the instrument meets all specifications.

Performance Tests
Absolute Amplitude Accuracy
Residual Responses
Displayed Average Noise Level
Frequency Response 300 kHz to 3 GHz
Frequency Response above 3 GHz
Frequency Response (Option 110)
Frequency Response (Option 123) if Option 123 is present

Adjustments and performance testing requires the use of the calibration software. The latest software information and downloads are available at:

http://www.agilent.com/find/calibrationsoftware

End of Installation

For assistance, get in touch with your nearest Agilent Technologies Sales and Service Office. To find your local Agilent office access the following URL, or call the following telephone number:

http://www.agilent.com/find/assist

1-800-452-4844 (8am-8pm EST)